

SmartSwitch 9000
9F426-02
User's Guide

9031692-03

CABLETRON
SYSTEMS
The Complete Networking Solution™

Notice

Cabletron Systems reserves the right to make changes in specifications and other information contained in this document without prior notice. The reader should in all cases consult Cabletron Systems to determine whether any such changes have been made.

The hardware, firmware, or software described in this manual is subject to change without notice.

IN NO EVENT SHALL CABLETRON SYSTEMS BE LIABLE FOR ANY INCIDENTAL, INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES WHATSOEVER (INCLUDING BUT NOT LIMITED TO LOST PROFITS) ARISING OUT OF OR RELATED TO THIS MANUAL OR THE INFORMATION CONTAINED IN IT, EVEN IF CABLETRON SYSTEMS HAS BEEN ADVISED OF, KNOWN, OR SHOULD HAVE KNOWN, THE POSSIBILITY OF SUCH DAMAGES.

© Copyright March 1998 by:

Cabletron Systems, Inc.
35 Industrial Way
Rochester, NH 03867-5005

All Rights Reserved
Printed in the United States of America

Order Number: 9031692-03

LANVIEW is a registered trademark, and **SmartSwitch** is a trademark of Cabletron Systems, Inc.

CompuServe is a registered trademark of CompuServe, Inc.

i960 microprocessor is a registered trademark of Intel Corp.

Ethernet is a trademark of Xerox Corporation.

FCC Notice

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment uses, generates, and can radiate radio frequency energy and if not installed in accordance with the operator's manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his own expense.

WARNING: Changes or modifications made to this device which are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

VCCI Notice

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

この装置は、情報処理装置等電波障害自主規制協議会（V C C I）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

DOC Notice

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

DECLARATION OF CONFORMITY ADDENDUM

Application of Council Directive(s): **89/336/EEC
73/23/EEC**

Manufacturer's Name: **Cabletron Systems, Inc.**

Manufacturer's Address: **35 Industrial Way
PO Box 5005
Rochester, NH 03867**

European Representative Name: **Mr. J. Solari**

European Representative Address: **Cabletron Systems Limited
Nexus House, Newbury Business Park
London Road, Newbury
Berkshire RG13 2PZ, England**

Conformance to Directive(s)/Product Standards: **EC Directive 89/336/EEC
EC Directive 73/23/EEC
EN 55022
EN 50082-1
EN 60950**

Equipment Type/Environment: **Networking Equipment, for use in a
Commercial or Light
Industrial Environment.**

We the undersigned, hereby declare, under our sole responsibility, that the equipment packaged with this notice conforms to the above directives.

Manufacturer

Mr. Ronald Fotino

Full Name

Principal Compliance Engineer

Title

Rochester, NH, USA

Location

Legal Representative in Europe

Mr. J. Solari

Full Name

Managing Director - E.M.E.A.

Title

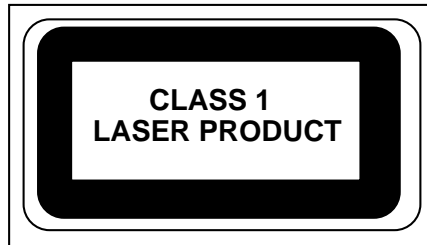
Newbury, Berkshire, England

Location

Safety Information

CLASS 1 LASER TRANSCEIVERS

The FPIM-05 and FPIM-07 are Class 1 Laser Products



The FPIM-05 and FPIM-07 use Class 1 Laser transceivers. Read the following safety information before installing or operating these adapters.

The Class 1 laser transceivers use an optical feedback loop to maintain Class 1 operation limits. This control loop eliminates the need for maintenance checks or adjustments. The output is factory set, and does not allow any user adjustment. Class 1 Laser transceivers comply with the following safety standards:

- 21 CFR 1040.10 and 1040.11 U.S. Department of Health and Human Services (FDA).
- IEC Publication 825 (International Electrotechnical Commission).
- CENELEC EN 60825 (European Committee for Electrotechnical Standardization).

When operating within their performance limitations, laser transceiver output meets the Class 1 accessible emission limit of all three standards. Class 1 levels of laser radiation are not considered hazardous.

Safety Information

CLASS 1 LASER TRANSCEIVERS

Laser Radiation and Connectors

When the connector is in place, all laser radiation remains within the fiber. The maximum amount of radiant power exiting the fiber (under normal conditions) is -12.6 dBm or 55×10^{-6} watts.

Removing the optical connector from the transceiver allows laser radiation to emit directly from the optical port. The maximum radiance from the optical port (under worst case conditions) is 0.8 W cm^{-2} or $8 \times 10^3 \text{ W m}^{-2} \text{ sr}^{-1}$.

Do not use optical instruments to view the laser output. The use of optical instruments to view laser output increases eye hazard. When viewing the output optical port, power must be removed from the network adapter.

Chapter 1 Introduction

Features.....	1-1
Related Manuals.....	1-4
Getting Help	1-4

Chapter 2 Installing the SmartSwitch 9000 Module

Unpacking the Module.....	2-1
Installing an FPIM.....	2-1
User-Accessible Components.....	2-2
Installing the Module into the SmartSwitch 9000 Chassis.....	2-5
The Reset Switch	2-7

Chapter 3 Operation

System Management Buses	3-2
SMB-1 Bus	3-2
SMB-10 Bus	3-2
System Diagnostic Controller.....	3-2
DC/DC Converter	3-3
INB Interface	3-3
SecureFast Switch.....	3-3
i960 Core	3-4

Chapter 4 LANVIEW LEDs

Chapter 5 Specifications

Technical Specifications.....	5-1
CPU.....	5-1
Memory	5-1
Standards	5-1
Network Interface.....	5-1
Safety	5-2
Service.....	5-2
Physical.....	5-2
Dimensions	5-2
Weight.....	5-2
Environment.....	5-2

Appendix A FPIM Specifications

FPIM-00 and FPIM-01.....A-1

FPIM-02 and FPIM-04.....A-2

FPIM-05 and FPIM-07.....A-3

Introduction

The 9F426-02 FDDI SmartSwitch® Module shown in Figure 1-1, is a three port switch module with two front panel FDDI interfaces and one INB-2 backplane interface. The external FDDI networks are connected to the module using standard Cabletron FPIMs on the front panel. The 9F426-02 module employs SmartSwitch ASIC, a high performance switch design, and an Intel i960 microprocessor. The module can redirect one or both of its front panel FDDI interfaces to the FNB backplane, creating an INB-1 to FNB bridge/switch product that allows a migration from FNB modules to INB-1 modules.

Features

Processor

The 9F426-02 is equipped with an advanced Intel i960 microprocessor. This microprocessor provides a platform for all management functions within a scalable RISC-based architecture.

Packet Switch Engine

The 9F426-02 module incorporates the SmartSwitch ASIC, a collection of custom ASICs designed specifically for high-speed switching. The SmartSwitch ASIC bus is 64-bits wide with a bandwidth of 320 Mbps. Since all frame translation, address lookups, and forwarding decisions are performed in hardware, the 9F426-02 can obtain a throughput performance of greater than 750K pps.

Management

The 9F426-02 module has two full implementations of SMT (Version 7.3), one per interface, and SNMP for local and remote management. Local management is provided through the RS-232 COM ports on the SmartSwitch 9000 Environmental Module using a standard VT-220 terminal or emulator. Remote management is possible through Cabletron's SPECTRUM or any SNMP compliant management tool as well as telneting to the module. Management features including module insert/bypass control, MAC placement, front panel/FNB configuration, and SMT statistics. Switching statistics on both FDDI interfaces provide frames filtered, frames forwarded, and all Spanning Tree Protocol parameters. The 9F426-02 module supports the IETF FDDI MIB (RFC-1512), IETF MIB II (RFC-1213), IETF BRIDGE MIB (RFC-1493), and a host of Cabletron enterprise MIBs. In addition, the front panel provides LEDs for FDDI link status per port, as well as transmit and receive activity.

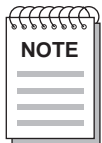
Connectivity

The 9F426-02 module has one interface to the INB-2, two front panel FDDI interfaces, or two FNB interfaces to the SmartSwitch 9000 FNB backplane. The front panel connections are via standard Cabletron FPIMs. The INB-1 interface is fixed, however, and the two FDDI interfaces can attach to one or both of the front panel connectors, one or both of the FNB interfaces (FDDI-1 or FDDI-2), or one of each.

Management Information Base (MIB) Support

Both 9F426-02 provides MIB support including:

- IETF FDDI MIB
- IETF MIB II
- IETF Bridge MIB
- a host of Cabletron Enterprise MIBs.



For a complete list of supported MIBs, refer to the release notes provided in the 9F426-02 package.

LANVIEW LEDs

The 9F426-02 uses LANVIEW – the Cabletron Systems built-in visual diagnostic and status monitoring system. With LANVIEW LEDs, you can quickly identify the device, port, and physical layer status at a glance.

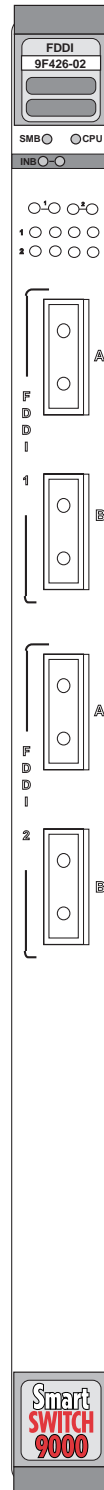


Figure 1-1. The 9F426-02 Module

Related Manuals

The manuals listed below should be used to supplement the procedures and technical data contained in this manual.

SmartSwitch 9000 Installation Guide
SmartSwitch 9000 9C300-1 Environmental Module User's Guide
SmartSwitch 9000 9C214-1 AC Power Supply User's Guide
INB Terminator Modules Installation Guide
SmartSwitch 9000 Module Local Management User's Guide

Getting Help

For additional support related to this device or document, contact the Cabletron Systems Global Call Center:

Phone	(603) 332-9400
Internet mail	support@ctron.com
FTP	ctron.com (134.141.197.25)
Login	<i>anonymous</i>
Password	<i>your email address</i>
BBS	(603) 335-3358
Modem setting	8N1: 8 data bits, No parity, 1 stop bit
For additional information about Cabletron Systems or its products, visit the World Wide Web site: http://www.cabletron.com/ For technical support, select Service and Support .	
To send comments or suggestions concerning this document, contact the Cabletron Systems Technical Writing Department via the following email address: TechWriting@ctron.com <i>Make sure to include the document Part Number in the email message.</i>	

Before calling the Cabletron Systems Global Call Center, have the following information ready:

- Your Cabletron Systems service contract number
- A description of the failure
- A description of any action(s) already taken to resolve the problem (e.g., changing mode switches, rebooting the unit, etc.)
- The serial and revision numbers of all involved Cabletron Systems products in the network
- A description of your network environment (layout, cable type, etc.)
- Network load and frame size at the time of trouble (if known)
- The device history (i.e., have you returned the device before, is this a recurring problem, etc.)
- Any previous Return Material Authorization (RMA) numbers

Installing the SmartSwitch 9000 Module

This module uses FPIMs for the front panel connections. They are not shipped with the module and must be purchased separately. For more information on FPIMs see Appendix A.

Unpacking the Module

1. Carefully remove the module from the shipping box. (Save the box and packing materials in the event the module must be reshipped.)
2. Remove the module from the plastic bag. Observe all precautions to prevent damage from Electrostatic Discharge (ESD).
3. Carefully examine the module, checking for damage. If any damage exists, DO NOT install the module. Contact Cabletron Systems Technical Support immediately.

Installing an FPIM

The 9F426-02 SmartSwitch module is shipped without FPIMs. To install an FPIM, follow the procedure below:

1. Remove the module if it is installed in the SmartSwitch 9000 chassis.
2. Remove the blank front cover over the FPIM slot.
3. Install the FPIM as shown in Figure 2-1. Ensure that the rear connector is seated firmly before tightening the two mounting screws.

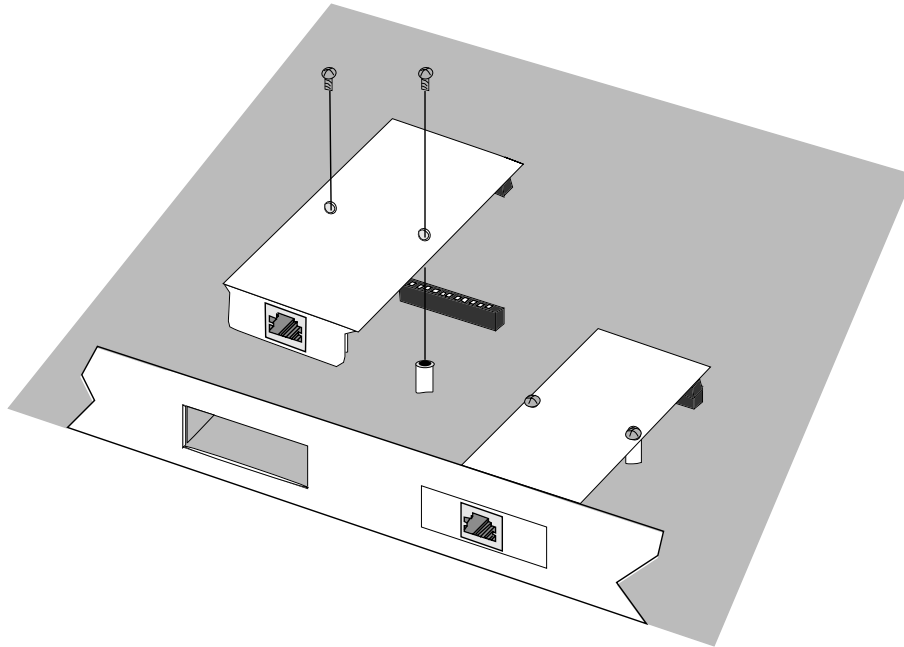


Figure 2-1. Installing an FPIM

User-Accessible Components

Figure 2-2 shows the various components that are accessible to the user. These consist of an eight-position DIP switch (explained below), replaceable PROMs and sockets for RAM. These will be used for future upgrades. Instructions for installing the components will be supplied with the upgrade kit.

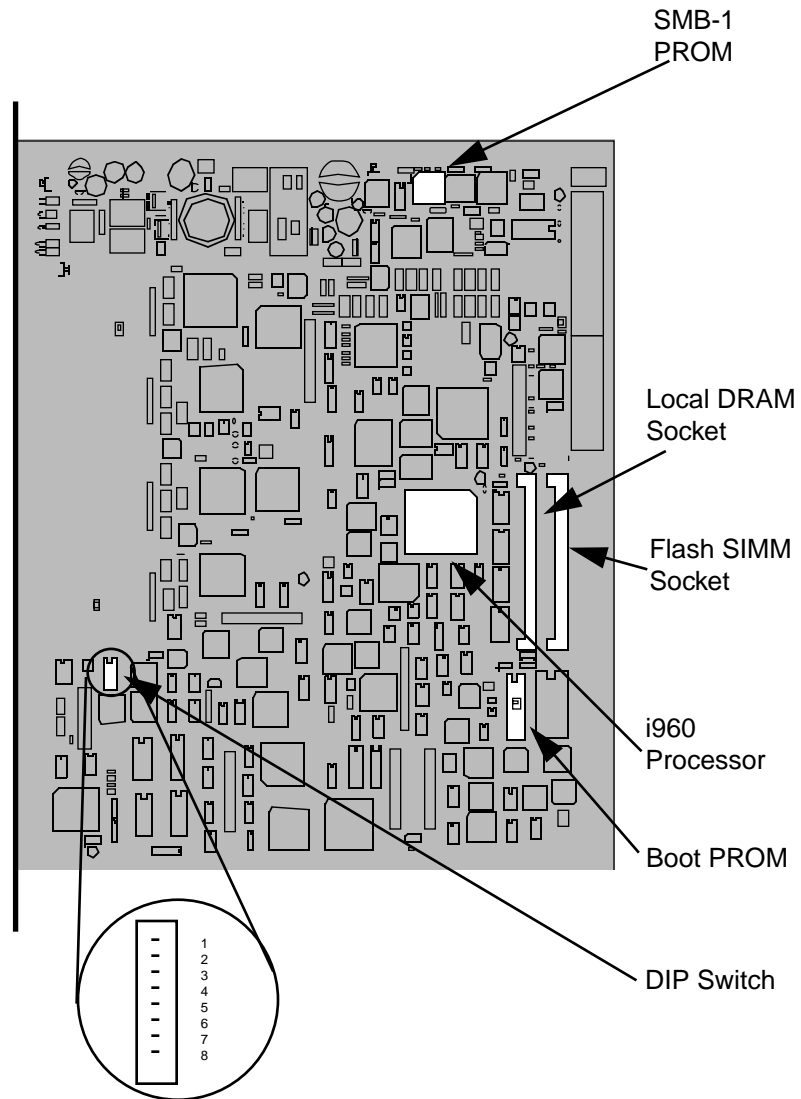


Figure 2-2. User Accessible Components

An eight-position DIP switch is located on the module card as shown in Figure 2-2. The function of the switches are listed in Table 2-1.

See the **Cautions** at the end of this table.

Table 2-1. Function of DIP Switch

Switch	Function	Description
8	Clear Password ¹	When toggled, this switch clears user-entered passwords stored in NVRAM, and restores the default passwords. Once reset you can use the defaults or enter new passwords.
7	Clear NVRAM ²	The module uses NVRAM to store user entered parameters such as IP addresses, device name, etc. To reset these parameters to the factory defaults, toggle this switch. Once reset, you can use the defaults or enter new parameters, which are stored in NVRAM when the module is powered down, and remain there until the switch is toggled again.
6	Force BootP Download	Toggling this switch after pulling the board out of the SmartSwitch 9000, clears download information from NVRAM and forces image files to be downloaded from the station connected to the EPIM on the Environmental Module configured to act as that modules' BOOTP server.
5	Reserved	For Factory Use Only
4	Reserved	For Factory Use Only
3	Reserved	For Factory Use Only
2	Reserved	For Factory Use Only
1	Reserved	For Factory Use Only

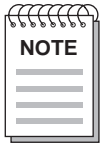


¹**Caution:** Do not toggle Switch 8 unless you intend to reset the user configured passwords to their factory default settings.

²**Caution:** Do not toggle Switch 7 unless you intend to reset the user parameters to the factory default settings.

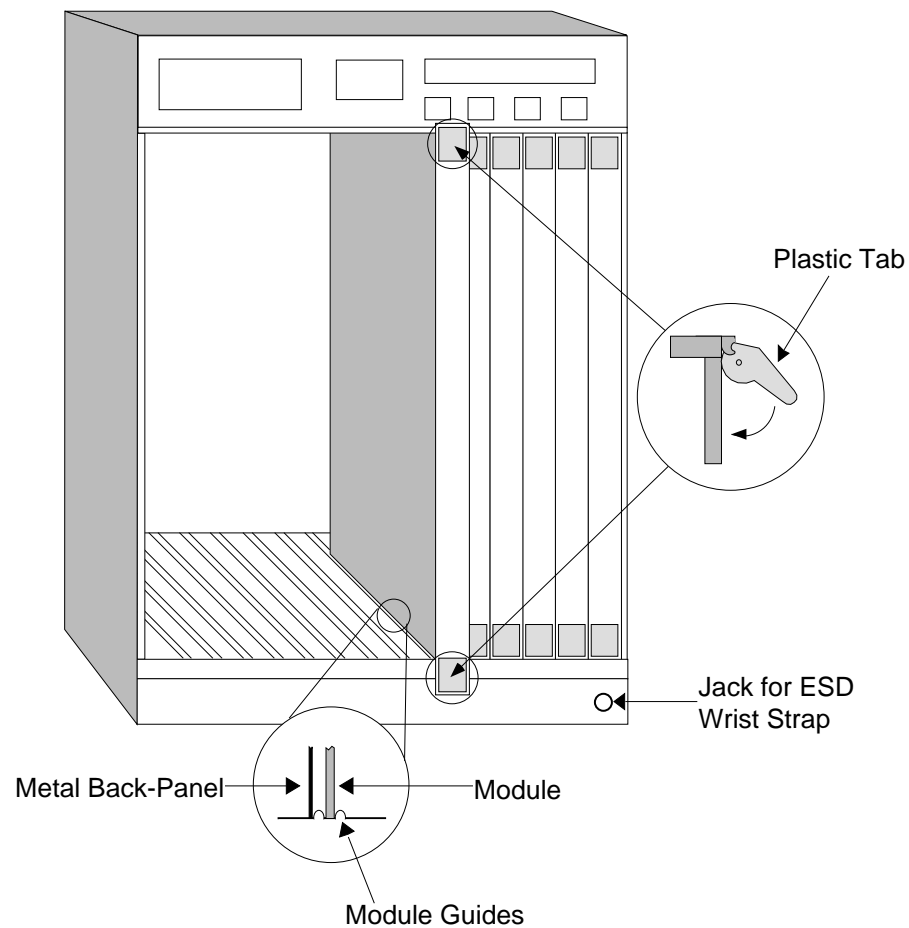
Installing the Module into the SmartSwitch 9000 Chassis

To install the SmartSwitch 9000 module, follow the steps below:



*The INB Terminator Modules must be installed on the rear of the chassis before powering up this module. Refer to the **INB Terminator Modules Installation Guide** for information and installation procedure.*

1. Switch off the power supplies and remove all power from the SmartSwitch 9000 chassis.
2. Remove the blank panels, covering the slots that the module is being mounted in. All other slots must be covered, if modules are not being installed, to ensure proper airflow and cooling.
3. Attach one end of the ESD wrist strap packaged with the SmartSwitch 9000 chassis to your wrist. Plug the other end into the ESD Wrist Strap Grounding receptacle in the lower right corner of the SmartSwitch 9000 Chassis shown in Figure 2-3.
4. Slide the module into the slot and lock down both the top and bottom plastic tabs, as shown in Figure 2-3. Take care that the module slides in straight and engages the backplane connectors properly. When installing the module, ensure that both circuit cards are between the card guides, as shown in Figure 2-3. Check both the upper and lower tracks of both cards.



Warning:

Ensure that the circuit card is between the card guides.

Lock down the top and bottom plastic tabs at the same time, applying even pressure.

Figure 2-3. Installing the 9F426-02 Module

The Reset Switch

The Reset switch is located under the top plastic tab as shown in Figure 2-4. It serves two functions:

- Pressing the reset switch twice within three seconds causes the processor (i960) to reset.
- Pressing and holding the switch on for three or more seconds causes the module to shutdown.
- Momentarily pressing the switch restarts the module.

SNMP management may be used to disable this switch to enhance module security.

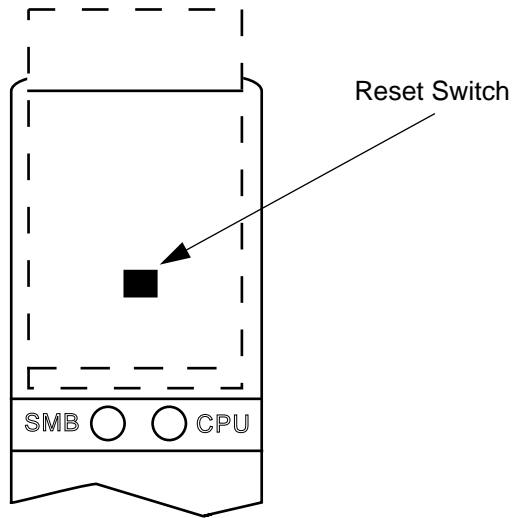


Figure 2-4. The Reset Switch

Operation

The 9F426-02 module is capable of switching any three, of five possible interfaces, depending on how it is configured. The INB-2 connection is always fixed. When configuring the module, the decision is made to connect both front panel ports, both FNB ports, or one front panel and one FNB port to the traditional switch.

As shown in Figure 3-1, packets may be received at the front panel FDDI ports, the FNB rings (FNB-1 and/or FNB-2), and/or the INB-1 bus, according to the user configuration. These packets are converted into canonical format. The SmartSwitch ASIC circuitry decides from header information where the packets should be sent. They are then converted from canonical format to the proper format for that interface.

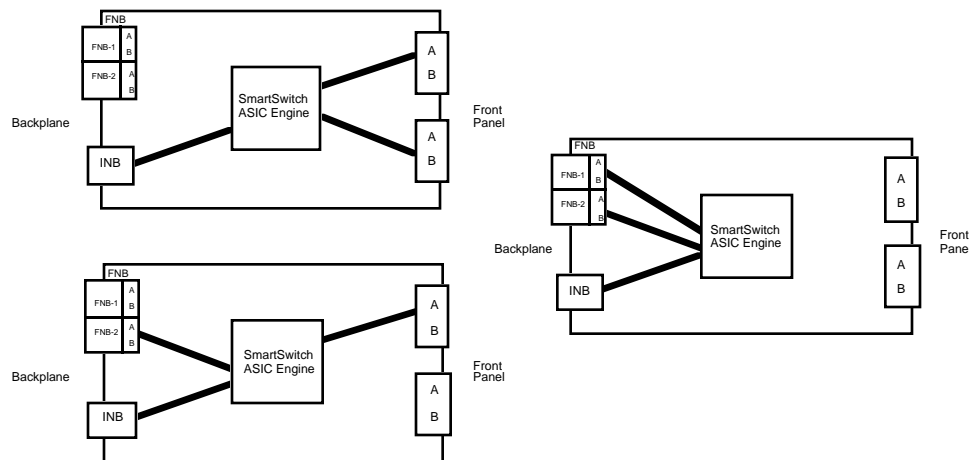


Figure 3-1. Configuration Options

System Management Buses

There are two management channels within the SmartSwitch 9000 system: the SMB-1 and the SMB-10. These buses provide out-of-band management and inter-module management communication.

SMB-1 Bus

The SMB-1 is a 1Mbps management bus located within the SmartSwitch 9000. This bus is utilized by all diagnostic controllers in the system including connectivity modules, power supply modules and the environmental module. The SMB-1 transports inter-chassis information between system components, such as power and environmental information, as well as diagnostic messages. Periodic loop-back tests are performed by all modules which share this bus to ensure the validity of SMB-1. In the event a failure is detected on SMB-1, the SMB-10 may be used as an alternate communication channel.

SMB-10 Bus

The SMB-10 is a 10Mbps management bus located within the SmartSwitch 9000 that is also used for inter-chassis communication of modules, as well as serving as an out-of-band management channel into the SmartSwitch 9000. The SMB-10 is externalized from the chassis via an optional Ethernet Port Interface Module (EPIM) located on the front of the Environmental Module. Through an EPIM connection, full SNMP management of the SmartSwitch 9000 is available out-of-band from user data. Modules that share the SMB-10 bus periodically send out loop-back packets to ensure the validity of SMB-10. In the event a fault is detected on the SMB-10, the SMB-1 can be used as an alternate communication channel by the modules.

System Diagnostic Controller

This diagnostic controller is composed of a Z-80 microprocessor and its supporting logic. The diagnostic controller is designed to control the power-up sequencing of modules, monitor the 9F426-02 input and output power parameters, keep watch over the main host processor, as well as monitor the temperature and control the SMB LANVIEW diagnostic LED. Although the diagnostic controller and the main host processor can operate independent of each other if needed, they exchange information about each other's status and overall module condition. The information gathered by the diagnostic controller is available to the network manager via local/remote management and the LCD located on the environment module. The 9F426-02 has been designed so that in the event of a diagnostic controller fault, the 9F426-02 will continue to function.

DC/DC Converter

The DC/DC converter converts the 48 VDC on the system power bus to the necessary operating voltages for its host network services module. The diagnostic controller monitors and controls the operation of the DC/DC converter.

INB Interface

Each module that attaches to the INB has an INB Network Interface Block (NIB). The INB NIB converts canonical frames to fixed length data blocks for transmission onto the INB. For data blocks received from the INB, the INB NIB reassembles the data blocks received from the INB back into canonical frames for transmission to the SmartSwitch ASIC then from the SmartSwitch ASIC to the front panel ports.

SecureFast Switch

The SmartSwitch ASIC is a hardware-based switch design that is the key building block of the SmartSwitch 9000. All filtering/forwarding decisions are made in hardware, as opposed to software as in traditional switches. This custom hardware allows the SmartSwitch ASIC to process over 150K frames per second. The SmartSwitch ASIC is designed to support up to 64 ports that are shared between the host processor, the INB backplane, and LAN/WAN interfaces on the front panel of SmartSwitch 9000 modules.

The SmartSwitch ASIC can operate in two modes: as a traditional switch, or as a SecureFast Switch (SFS). When operating in traditional switch mode, it makes filtering/forwarding decisions based on Destination Address (DA), with standard IEEE 802.1d learning. When operating in SmartSwitch ASIC mode, all filtering/forwarding decisions are made based on a DA-SA pair and its receive port. These DA-SA pairs with the associated receive port are programmed into the switch using Cabletron's SecureFast Virtual Network Server (SecureFast VNS). This provides the network administrator with the ultimate network security without the performance degradation found when using routers or traditional switches with special filtering capabilities. The SmartSwitch 9000 hub can support modules operating in traditional switch mode and SmartSwitch ASIC mode simultaneously providing security when/where needed and ease of configuration where security is not required.

i960 Core

The i960 core provides the SNMP protocol stacks, to support industry-standard MIBs. Additionally, Cabletron enterprise extension MIBs are supported for each media type. Advanced management services, such as the Distributed LAN Monitor, telnet and network address to MAC address mapping, are also provided by the i960 core.

The Host engine sends and receives packets via the CPU SmartSwitch ASIC Interface. This allows the traditional switch to perform spanning tree protocol and other traditional switching functions. The SMB Interfaces provide communication to the Host Engine for management functions and communication with other modules in the chassis.

LANVIEW LEDs

The front panel LANVIEW LEDs indicate the status of the module and may be used as an aid in troubleshooting. Shown in Figure 4-1 is the LANVIEW LEDs of the 9F426-02 module.

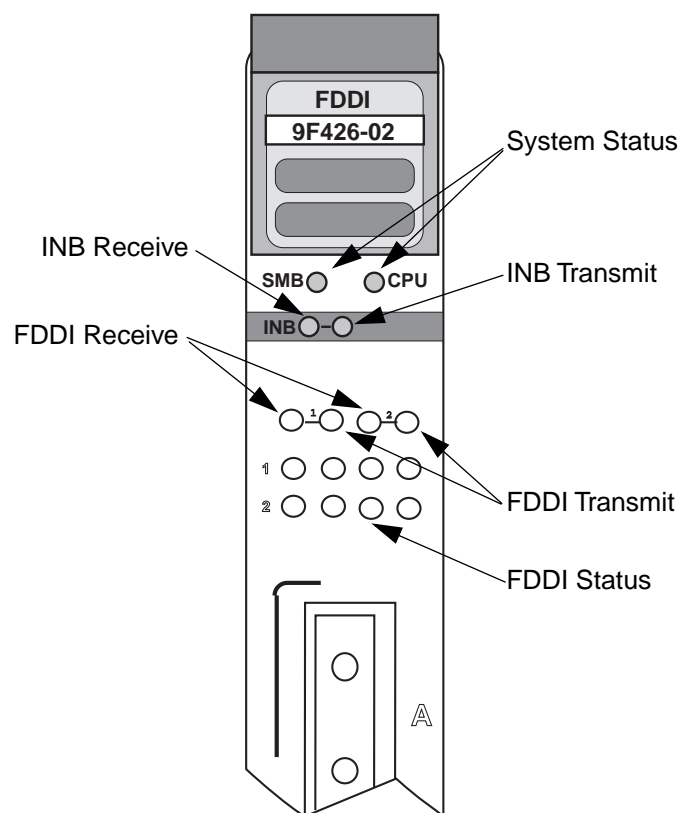


Figure 4-1. The LANVIEW LEDs

The functions of the two System Status LEDs, System Management Bus (SMB) and the CPU, are listed in Table 4-1.

Table 4-1. System Status (SMB and CPU) LEDs

LED Color	State	Description
Green	Functional	Fully operational.
Yellow	Crippled	Not fully operational (i.e., one bad port).
Yellow/Green	Booting	Blinks yellow and green while booting.
Red	Reset	Normal power-up reset.
Red (Flashing)	Failed	Fatal error has occurred.
Off	Power off	Module powered off.

The function of the INB receive LED is listed in Table 4-2.

Table 4-2. INB Receive LED

LED Color	State
Yellow (Flashing)	Activity
Off	No Activity

The functions of the INB transmit LED are listed in Table 4-3.

Table 4-3. INB Transmit LED

LED Color	State
Green	INB Link
Green (Flashing)	Activity
Off	No Activity

The function of the FDDI receive LEDs is listed in Table 4-4.

Table 4-4. FDDI Receive LEDs

LED Color	State
Yellow (Flashing)	Activity
Off	No Activity

The function of the FDDI Transmit LED is listed in Table 4-5.

Table 4-5. FDDI Transmit LEDs

LED Color	State
Green (Flashing)	Activity
Off	No Activity

The FDDI status LEDs display the status when bridging to the front panel port from either FNB ring. The “A” and “B” LEDs indicate the status of the A and B ports. The “P” and “S” LEDs indicate the status of the primary and secondary FDDI rings. When bridging between FNB rings, the FDDI status LEDs are not operational. The FDDI Status LEDs are shown in Figure 4-2.

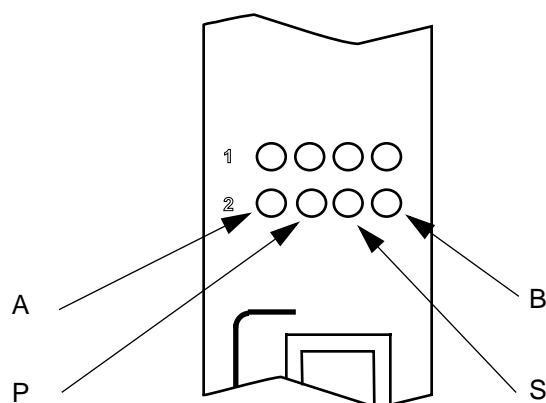


Figure 4-2. FDDI Status LEDs

The functions of the FDDI Status LEDs are listed in Table 4-6.

Table 4-6. FDDI Status LEDs

A	P	S	B	STATE
Green	N/A	N/A	Green	Ports Enabled & Active
Green	Green	Off	Green	THRU A, MAC on Primary, Secondary Bypasses Board
Green	Off	Green	Green	THRU B, MAC on Secondary, Primary Bypasses Board
Green	Green	Red	Off	WRAP A, MAC on Primary
Off	Green	Red	Green	WRAP B, MAC on Primary
Green	Off	Off	Green	BYPASS Primary & Secondary
Green	Red	Red	Off	TWISTED A-A
Off	Red	Red	Green	TWISTED B-B
Green	Red	Red	Green	TWISTED A-A, B-B
Yellow	Off	Off	Yellow	PCM did not complete, Not Active
Red	Off	Off	Red	Ports Disabled

Specifications

Technical Specifications

CPU

Intel i960 RISC based microprocessor

Memory

4 Meg. Local RAM (expandable to 12 Meg.)
4 Meg. Flash Memory (expandable to 16 Meg.)
16 Meg. DRAM
2 Meg. Packet RAM

Standards

ANSI FDDI X3T9.5
SMT
MAC
PHY
MMF-PMD
SMF-PMD

Network Interface

Cabletron FPIMs

Safety



It is the responsibility of the person who sells the system to which the module will be a part to ensure that the total system meets allowed limits of conducted and radiated emissions.

This equipment meets the safety requirements of:

- UL 1950
- CSA C22.2 No. 950
- EN 60950
- IEC 950
- EMI Requirements of FCC Part 15 Class A
- EN 55022 Class A
- VCCI Class I
- EMC requirements of:

EN 50082-1

IEC 801-2 ESD

IEC 801-3 Radiated susceptibility

IEC 801-4 EFT

Service

MTBF (MHBK-217E)	>200,000 hrs.
MTTR	<0.5 hr.

Physical

Dimensions

35.0 D x 44.0 H x 3.0 W centimeters
(13.8 D x 17.4 H x 1.2 W inches)

Weight

Unit:	1.36 kg. (3lb)
Shipping:	1.81 kg. (4lb)

Environment

Operating Temperature	5 to 40° C
Storage Temperature	-30 to 90° C
Relative Humidity	5% to 95% non-condensing

FPIM Specifications

This SmartSwitch 9000 module uses Fiber Port Interface Modules (FPIM) to provide front panel cable connections. The FPIMs are user-installable. See section titled **Installing an FPIM** on page 2-1.

FPIM-00 and FPIM-01

The FPIM-00 and FPIM-01 provide a multimode fiber connection. The FPIM-00 uses a MIC-style connector and the FPIM-01 uses an SC-type connector. The specifications for both devices are listed in Table A-1.

Table A-1. FPIM-00 and FPIM-01 Specifications

Parameter	Typical Value	Worst Case	Worst Case Budget	Typical Budget
Receive Sensitivity	-30.5 dBm	-28.0 dBm	—	—
Peak Input Power	-7.6 dBm	-8.2 dBm	—	—

Transmitter power parameters are listed in Table A-2.

Table A-2. Transmitter Power Parameters

Parameter	Typical Value	Worst Case	Worst Case Budget	Typical Budget
50/125 μm fiber	-13.0 dBm	-15.0 dBm	13.0 dB	17.5 dB
62.5/125 μm fiber	-10.0 dBm	-12.0 dBm	16.0 dB	20.5 dB
100/140 μm fiber	-7.0 dBm	-9.0 dBm	19.0 dB	23.5 dB
Error Rate	Better than 10^{-10}			

The link distance is up to 2 kilometers on the multimode fiber-optic cable as specified by ANSI MMF-PMD.

FPIM-02 and FPIM-04

The FPIM-02 has an RJ-45 connector supporting an Unshielded Twisted Pair (UTP) connection. The FPIM-04 has an RJ-45 connector supporting a Shielded Twisted Pair (STP) connection. The pinouts for both are listed in Table A-3.

Table A-3. FPIM-02 and FPIM-04 Pinouts

Pin Number	Represents	Pin Number	Represents
1	Transmit+	5	NA
2	Transmit-	6	NA
3	NA	7	Receive+
4	NA	8	Receive-

The link distance is up to 100 meters on unshielded twisted pair cable as specified by ANSI TP-PMD.

FPIM-05 and FPIM-07

The FPIM-05 and FPIM-07 provide a single-mode fiber connection. The FPIM-05 uses a MIC-style connector and the FPIM-07 uses an SC-type connector. The specifications for both devices are listed in Table A-4.

Table A-4. FPIM-05 and FPIM-07 Specifications

Parameter	Typical	Minimum	Maximum
Transmitter Peak Wave Length	1300 nm	1270 nm	1330 nm
Spectral Width	60 nm	-	100 nm
Rise Time	3.0 nsec	2.7 nsec	5.0 nsec
Fall Time	2.5 nsec	2.2 nsec	5.0 nsec
Duty Cycle	50.1%	49.6%	50.7%
Bit Error Rate	Better than 10^{-10}		

The link distance is up to 40 kilometers (max) and 25 kilometers (typical) on single mode fiber-optic cable as specified by ANSI SMF-PMD.

